GMI, Jan 2006 J values with fractional cloud cover (Prather, Neu, & Zhu, UC Irvine)

Our novel approach for calculating the average photolysis rates in grid boxes with fractional cloud cover is: (1) assume a max-random overlap describes the vertical overlap of the different cloud groups; (2) generate all the independent column atmospheres (ICA, 15 in the case shown here); (3) sort these ICA by total optical depth (OD); (4) define break points in OD corresponding roughly to different cloud types (0, ½, 4, 30); (5) select the specific ICA in the middle of the weighting interval (e.g., ½ < OD < 4) as the quadrature atmosphere; (6) compute J's for the 4 ICA and use the weight defined the probability (e.g., fraction of area with ½ < OD < 4).

We use total optical depth thresholds of :

$0<OD\leqslant 0.5$

$0.5<OD\leqslant 4$

$4<OD\leqslant 30$

$30<OD<INF$

to define our quadrature atmosheres. The cumulative optical depths for the 15 single column atmospheres in Figure b) above are shown, as well as the four quadrature atmospheres for this case.